ASSESSING THE SUSTAINABILITY OF RESIDENTIAL REAL ESTATE PRICE DEVELOPMENTS

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MOTIVATION AND OBJECTIVES

Real estate markets and financial stability:

| real estate price corrections | corrections in debtors' balance sheet | ↘ in debtors' repayment capacity & ↗ no. of houses for sale | Fire sales | ↘ residential investment & ↘ economic growth & ↘ lending & ↗ risk aversion |

→ Financial crisis are in many cases related to real estate prices (Claessens et al., 2011)

→ Real estate prices are one of the components of the financial cycle (Drehmann et al, 2012)

→ A large use of macroprudential policies in relation to real estate markets

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LITERATURE REVIEW

- **Corradin and Fontana (2013):** Error-correction model with Markov switching for 13 European countries. House price dynamics generally follow 3 regimes: high, medium and low

- **Anundsen (2012, 2016)** analyse the developments in US, Finland and Norway starting from Stiglitz's (1990) definition of rational bubbles ➔ house prices are determined by fundamentals when: (i) house prices are increasing on the account of expectations of further increases, (ii) fundamental factors are non-stationary and (iii) there is a cointegration relationship between house prices and fundamental factors.

- **Panagiotidis and Printizs (2015):** ECM for estimating the effect of macroeconomic factors on real estate prices for Greece; the covariates used refer to: consumer price index, industrial production index, volume of retail trade, interest rates, annual growth rate of mortgages, money supply growth rate and unemployment.

- **Geng (2018):** multivariate econometric framework for modelling house prices; indicators for demand and supply factors and for the policy, institutional and structural factors.

DATA AND METHODOLOGY (1)

➢ Quarterly data covering the period 2003 – 2017

➢ **Real estate price (RRE) index for Bucharest**:

Extension of real estate index for Bucharest	
2002 - 2003	Data from The National Union of Public Notaries in Romania for a standard 3 bedrooms apartment in Bucharest, 70 square meters and built after 1970s.
2004 -2008	Data from EFG Eurobank Property for Bucharest real estate index
2009 +	Public information from the National Institute of statistics

➢**Demand side variables**: disposable income or wages, a measure for demographics (the share of definitive emigration to entire population), unemployment rate, user costs (interest rate or spreads), intention to buy a house,

DATA AND METHODOLOGY (2)

➢ **Supply side variables**: housing stock and construction costs

➢ **Dummy variables** accounting for:

1. Macroprudential regulation: loan-to-value (LTV) limits for mortgage loans in Romania ➜ takes the of 1 between 2004-2006 (LTV limit of 75% for mortgage loans) and from 2011 onwards (differentiated LTV limit for mortgage loans by currency of the loan and of the debtors' wage)

2. The First House governmental programme ➜ takes the value of 1 from June 2009 onwards

3. The burst of the financial crisis and methodological changes in the RRE index ➜ takes the value of 1 for 2009.

DATA AND METHODOLOGY (3)

1. **Bry and Bochan (1971) procedure, updated by Harding and Pagan (2002):**

➢ identification of turning-points (peaks or through, TPs) that allow the characterisation of cycles: duration, amplitude and sloe of the two phases: expansion or contraction

➢ restrictions imposed: (i) under the short cycle hypothesis each phase is restricted to min. two quarters and the whole cycle to five quarters; (ii) under the medium-term cycle hypothesis the restriction on the entire cycle is increased to nine quarters; (iii) the threshold for quarterly changes is 10.4%

➢ Concordance index (CI) between real estate prices and other real estate market variables (such as gross value added for construction and real estate) is calculated:

$$CI_{xy} = \frac{1}{T} \sum_{t=1}^{T} [C_t^x C_t^y + (1 - C_t^x) * (1 - C_t^y) \, \text{w}$$

Where C_t^x (C_t^y) $= \{0, if\, x\, (y\,)\, is\, in\, recession\, at\, time\, t\, and\, 1\, if\, x\, (y)it\, is\, in\, expansion\}$

DATA AND METHODOLOGY (3)

2. Engle Granger approach to Error Correction Model

- The first step (cointegration eq.)

$$rre_t = c + \beta_{inc} * Income + \beta_h * housing + \beta_{spread} * Spread + \varepsilon_t$$

- The second step (ECM model)

$$\Delta rre_t = c + \alpha_{rre} \left(rre_t - \beta_{inc} * Income + \beta_h * housing + \beta_{spread} * Spread \right) + \sum_{i=1}^{p} \rho_{rre,i} \Delta rre_{t-1}$$

$$+ \sum_{i=0}^{p} \rho_{h,i} \Delta housing_{t-1} + \sum_{i=0}^{p} \rho_{spread,i} \Delta Spread_{t-1} + \sum_{i=0}^{p} \rho_{ex,i} \Delta var\_Exog_{t-1} + Dummy_{var}$$

$$+ \varepsilon_t$$

where: <u>rre</u> = the real residential real estate prices; <u>inc/income</u> = disposable income; <u>h/housing</u> = the share of the housing stock to total population, spread = the difference between the interest rate and 3 months money market rates (Euribor and Robor), var_exog =exogenous variables such as intention to buy a house; <u>β Income/ housing and spread</u> = the coefficients for the variables from the cointegration eq., dummy = the 3 dummy variables and α_{rre} = the real estate prices adjustment parameter for the deviation from the long term relationship

- **Extension of the ECM model with regime switching**: the adjustment coefficient (α_{rre}) and the mean house prices (c) are considered regime specific, becoming $\alpha_{rre,s}$ and c_s, where <u>s represents the regime</u>.

RESULTS (1): CHARACTERISTICS OF REAL ESTATE CYCLES

	Duration* (years)		Amplitude** (%)		Slope***	
	Contractions	Expansions	Contractions	Expansions	Contractions	Expansions
Short cycles (minumum 1.25 years)						
RRE prices	5.75	4.63	-120.07	87.86	-5.22	4.79
GVA construction	2.33	2.00	-33.89	49.34	-3.63	6.17
GVA real estate	1.63	4.00	-17.48	36.24	-2.69	2.27
Medium cycles (minimum 5 years*)						
RRE prices	5.75	4.63	-120.07	87.86	-5.22	4.79
GVA real estate	5.25	4.00	-27.08	83.77	-1.29	5.24

Note: * the duration is calculated from peak to peak, ** the amplitude is the percentage change from trough to peak (expansion) or from peak to trough (contractions), *** amplitude per duration.

➢ The CI is higher between RRE index and GVA for construction sector (82%), compared to 75% for real estate sector (GVA real estate with one lag)

RESULTS (2): LONG RUN RELATIONSHIP

	Model 1	Model 2	Model 3	Model 4
Disposable income	0.62*** (0.12)		0.77*** (0.08)	
Unemployment rate		-0.07*** (0.02)		-0.05*** (0.01)
Spread local currency denominated loans	-0.03*** (0.01)	-0.03** (0.01)	-0.03*** (0.00)	-0.03*** (0.01)
Spread EUR denominated loans	-0.06*** (0.02)	-0.07** (0.02)	-0.05*** (0.00)	-0.04*** (0.02)
Housing stock	-0.23*** (0.01)	-0.22*** (0.02)	-0.29*** (0.01)	-0.26*** (0.02)
Construction costs			0.26** (0.14)	0.88*** (0.19)
Intention to buy a house			0.01** (0.00)	2.27*** (0.47)
Constant	3.88** (1.95)	14.91*** (0.73)	4.27** (1.48)	16.92*** (0.68)
Unit root test of the residuals	-1.89**	-3.53**	-4.98***	-4.10***
Adjusted R-squared	92%	92%	98%	95%

Note: All variables are in used in logs except for cost variables (interest rate, construction costs) and for the intention to buy a house index, therefore the coefficients represent elasticities with respect to house prices. A fully modified OLS (FMOLS) was used and the estimation period covers 2003 Q4-2017Q4.
The standard errors are displayed in brackets and the significance of parameters is set as: * p<0.10, ** p<0.05, *** p<0.01.

RESULTS (3): SHORT TERM DYNAMICS AND POTENTIAL REGIME CHANGES

Variables	Model 2 – short run		Model 3 – short run	
	One regime	Two regimes	One regime	Two regimes
Adjustment coefficient $_{t-1}$ (one regime)	-0.07* (0.05)		-0.12** (0.10)	
Adjustment coefficient $_{t-1}$ – regime1		-0.04 (0.05)		-0.18* (0.11)
Adjustment coefficient $_{t-1}$ – regime2		-0.21** (0.07)		-0.09** (0.01)
Change in house prices	0.20*** (0.04)	0.24*** (0.04)	0.23*** (0.03)	0.27*** (0.003)
Intention to buy a house (t-3)	0.005** (0.002)	0.005** (0.002)	0.003** (0.002)	-0.0003 (0.001)
Intention to buy a house (t-4)	0.004** (0.001)	0.004** (0.002)	0.005** (0.002)	0.002*** (0.002)
Dummy 2009	-0.51*** (0.01)	-0.52*** (0.02)	-0.52*** (0.01)	-0.54*** (0.001)
Dummy First House	-0.04*** (0.01)	-0.03*** (0.01)	-0.04*** (0.01)	-0.04** (0.00)
Change in disposable income (t-3)	0.72** (0.16)	0.94** (0.29)	0.72** (0.21)	0.86*** (0.01)
Adjusted R-squared / Akaike criterion	85%	-3.79	86%	-4.10
DW	1.88	2	2.06	2.13
No.obs	57	57	56	56

Note: OLS with Newey West standard errors. The standard errors are displayed in brackets and the significance is set as: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

CONCLUSIONS (1)

▪ From a financial stability perspective it is essential to understand to monitor and understand the drivers of real estate price, considering that deviations of real estate prices from fundamentals could impair financial stability.

▪ The turning point procedure indicates that real estate prices cycles last for around 10 years and exhibit higher amplitudes in case of contractions compared to expansions. The results for the real estate market activity show a significantly lower cycle (around 4 ½ years and a half and 6 ½ years).

▪ The long run relationships include generally macroeconomic factors (disposable income, unemployment rate), cost factors (spreads) and a housing stock measure.

CONCLUSIONS (2)

- On the short run other factors could explain price developments and their deviation from fundamentals: exogenous factors, expectations etc.

- Prices exhibit a reversion to mean (between 30% and 48% per year) and this translates as such: when prices are overvalued, between 30 and 40% of that overvaluation will be corrected in one year. However, under the two regime specification the results are inconclusive.

- There is an important persistency in the house prices, similar to the findings in the literature.

THANK YOU!